

Name: _____

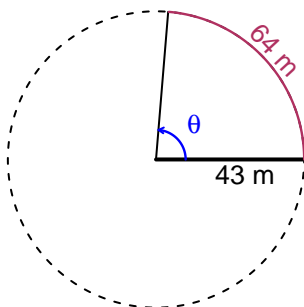
Date: _____

Trig Final (Solution v21)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 64 meters. The radius is 43 meters. What is the angle measure in radians?

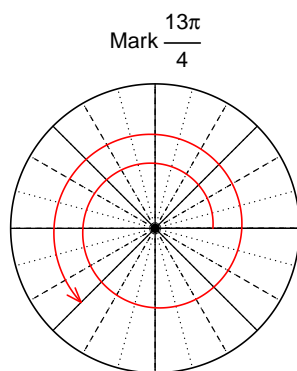


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

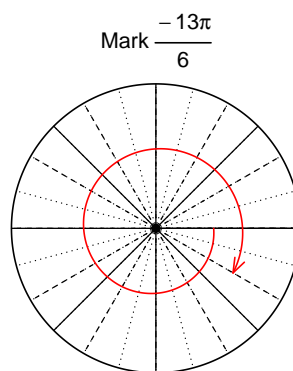
$\theta = 1.488$ radians.

Question 2

Consider angles $\frac{13\pi}{4}$ and $-\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(-\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).

Find $\sin(13\pi/4)$

$$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$$

Find $\cos(-13\pi/6)$

$$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$$

Question 3

If $\cos(\theta) = \frac{11}{61}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

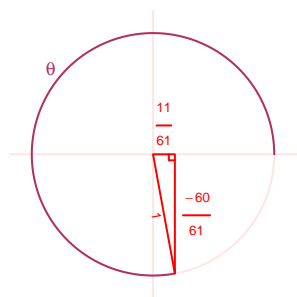
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}11^2 + B^2 &= 61^2 \\ B &= \sqrt{61^2 - 11^2} \\ B &= 60\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-60}{61}}{\frac{11}{61}} = \frac{-60}{11}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.02 Hz, a midline at $y = 3.32$ meters, and an amplitude of 8.4 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.4 \sin(2\pi 6.02t) + 3.32$$

or

$$y = -8.4 \sin(12.04\pi t) + 3.32$$

or

$$y = -8.4 \sin(37.82t) + 3.32$$